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Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No. 5,  
1950, pp. 646-667.

# INVESTIGATING THE FREQUENCY-REGULATION SYSTEM OF THE ENIN AC NETWORK ANALYZER

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The following is a digest of this article, which was read in May 1949 at the Power Engineering Institute imeni Krzhizhanovskiy (ENIN), Academy of Sciences USSR. This article is concerned mainly with the establishment of formulas convenient for computation in the designing of subject regulators.<sup>7</sup>

The universal ac computing table (network analyzer) which was constructed in 1947 at the Power Engineering Institute under the direction of I. S. Bruk (Elektrichestvo, No 1, 1948) is equipped with electronic frequency regulators. A tuning fork is employed as the frequency standard in the regulator, whose constructional details have already been described (Bruk, Chugunov, Pautin. "Electronic Frequency Regulator," Avtomatika i Telemekhanika, Vol IX, No 2, 1948). In the same report, the regulator's characteristics, as found experimentally, were indicated, and its advantages over other regulator types were also discussed.

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In this article, however, an attempt is made to establish the theory necessary for the future development and construction of regulators of the tuning-fork type. The main problem consists in maximizing the accuracy and stability of such a frequency regulator system.

Application of the formulas obtained here to a concrete design and comparison of the results obtained from these formulas with experimental data (Avtomatika i Telemekhanika, Vol IX, No 2, 1948) show that these formulas are convenient for analysis and designing.

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Subject system consists of five main loops: (1) measuring loop; (2) phase discriminator; (3) stabilizing loop; (4) output loop; and (5) controlled loop (object of regulation) which consists of a synchronous 400-cycle oscillator with exciter and a dc driving motor. The regulator, consisting of the first four loops, reacts against deviations in frequency and controls the excitation of the drive motor.

The electronic frequency regulator with tuning fork as the calibrating standard is the most highly perfected of existing frequency regulators for synchronous oscillators. This type of regulator finds practical application in other areas. The accuracy of frequency regulation is assured by the fact that the frequency quality and stability of the tuning fork considerably exceeds those of the oscillator circuit, which it replaces. To eliminate fluctuations in the oscillator, which are able to arise in such a system of fine frequency regulation, it is sufficient to include, in the construction of the regulator, a special stabilizing loop which represents essentially an RC-type blocking filter. Regulators of the type considered here can be designed in accordance with the proposed computational formulas, which represent the main contents of the article. N. N. Lenov and N. V. Pautin aided with the numerical analysis.

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